**REMARKS/ARGUMENTS**

Claims 1, 2, and 4-38 are currently pending in this application. By this Reply, claims 1, 2, 4-10, 14, 15, and 29-32 have been amended, claim 3 has been canceled, and claims 35-38 were added. No new matter has been introduced into the application by this Reply.

Applicants thank the Examiner for the indication of allowable subject matter in claims 11, 20, 21, 26, and 32.

The Action rejected the remaining claims as anticipated by US. Patent No. 4,498,785 to de Bruyne and as obvious over combinations of U.S. Patent Nos. 3,356,346; 4,911,556; 6,733,171; and 5,529,391 to Lansdberger, Lim et al., Schob, and Kindman respectively.

De Bruyne shows a floating horizontal stir bar driven with a spinning magnet and an impeller to create currents in the liquid. The stirring effect is the same as a conventional stirrer, except the floating stir bar is positioned at the top of the liquid instead of the bottom. The stirrer is a hollow tube or a design with two bulbous ends causing the horizontal position on the top of the liquid. The design limits the application to containers with radiused bottoms or bottom corners (like a Peterson Flask) to improve the stirring action.

Besides the stirrer's limited vessel application, the de Bruyne bar has at least two other disadvantages. First, because the stirrer must float on top of the liquid,

the length of the stirrer must be shorter than the diameter of the vessel, which limits de Bruyne's applicant to only certain vessel sizes. Second, the driving magnet force would have to be extremely strong to couple with the stir bar positioned several inches away.

Landsberger describes a vertical stirrer that mixes multiple tubes with a single magnetic drive using positive displacement mixing. There is no stirring taking place. The magnetic bar 32 is a plastic encapsulated magnet, the most common stir bar available. (Col. 3, lines 14-17). This arrangement is disadvantageous for two reasons as well. First, in operation, the magnet 18 drives the magnetic bar 32 up and down, which is harsh to the materials being mixed and unsuitable for many applications. Second, the mixing is not consistent along the length of the magnet because the magnetic flux varies during operation.

Lim shows rotating stir bars of various shapes that perform like a standard stir bar in the mixing affects imparted to the fluid. Lim's stir bar has flexible fingers that distort the mixing patterns but it will not prevent them. Lim also has disadvantages. First, the motion of the bar and fingers is a repetitive motion that creates patterns, in this case, like the familiar "doughnuts" where the vortex is the hole in the doughnut. Second, as with all rotating stir bars that rest on the bottom or float on top, a great deal of speed is required to mix a volume of liquid and this creates shear stresses at the stir bar and mixing patterns in the liquid.

Schob uses a float to hold the stirrer off the bottom of the vessel to reduce the mechanical damage to the stirred material. The float stabilizes and limits the movement of the stir bar extension and also maintains the stir bar body's horizontal orientation generally centered position in the container. Schob's rotating stir bar has a tip 1c on the bottom that helps it avoid crushing fragile cells or other solids forced below the spinning bar. The float holds a vertical shaft in a vertical position.

Kindman describes a stirring device with a thermal cycling device. Kindman's disadvantage is that the heater could interfere with the inductor field.

None of these references teach or suggest what is claimed. Each of the claim rejections is discussed in turn below.

**Claims 1, 2, 4-10, 12 and 13**

The Action rejected claims 1, 2, 4-10, 12, and 13 as obvious over Landsberger, Lim, and Schob.

Regarding claim 1, none of the reference teach or suggest a "plurality of magnetic fields are formed by a plurality of controllable magnetic drives located in proximity to the container, and the method [of] changing an energizing sequence of the magnetic drives by at least one of stopping, reversing, and random sequencing of the energizing sequence to create chaotic and gentle mixing action of the liquid by movement of the stir bar" as recited. Landsberger, Lim, and Schob all teach

spinning magnetic drives and fields that create the problematic vortex[1], not a plurality of each of these drives and fields as claimed. These pluralities of drives and fields, combined with random sequencing of same, both creates and controls the chaotic mixing claimed.

Regarding claim 4, the energizing sequence that creates the chaotic mixing can be "stored," and thus is "repeatable" when mixing subsequent solutions, insuring a similar chaotic stirring of solutions. This can be important in repetitive testing, for example.

Regarding claim 7, the references do not teach or suggest "providing the magnetic drives as inductor cores which extend from fixed inductor coils into proximity with the container" as recited. The magnetic coils in the prior art all move, and are not fixed, which adds potentially breakable parts that the claimed invention can avoid by using fixed cores.

Regarding claims 8 and 9, the energizing sequence (claim 8) and selective energization (claim 9), are both novel and non-obvious. None of the references teach or suggest any particular energization sequence besides spinning, and the selective sequence claimed is also not taught or suggested.

Claim 11 claims the L-shaped stir bar that was previously indicated as allowable subject matter.

[1] See the references submitted on the enclosed Information Disclosure Statement discussing the problems with

The remaining claims in this group all depend from one of the above-discussed claims and should be allowable for the same reasons as noted above.

**Claims 14-19, 22-25, and 27**

The Action rejected claims 14-19, 22-25, and 27 over combinations of Schob, Lim, and Kindman.

Regarding claim 14, the claim from which the other claims depend, none of these references teach or suggest a "plurality of magnetic drives form a plurality of magnetic fields, and a changing energizing sequence of the magnetic drives by at least one of stopping, reversing, and random sequencing of the energizing sequence changes the plurality of magnetic fields, which impart movement on the stir bar, which imparts chaotic and gentle mixing action of the liquid" as claimed. This language is similar to that in claim 1, and the reasons for the patentability of claim 1 are similar to those of claim 14.

Regarding claim 15, the coils and inductors are in a fixed array, which is not taught or suggested by the spinning magnets in the references.

Claims 20-22 and 32 claim the L-shaped stir bar that was previously indicated as allowable subject matter.

Claim 26 claims the simulator that was previously indicated as allowable.

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conventional spinning methods.

The remaining claims in this group all depend from one of the above-noted claims and should be allowable for the reasons discussed above.

**Claims 34-38**

New claims 34-38 all recite an L-shaped stirrer, and since this shape was indicated as allowable previously, these claims are believed to be allowable as written.

**Conclusion**

As most containers are taller than wide, the claimed vertical stirrers can be longer which creates more mixing action along their length. The vertical length allows the mixing of a volume of liquid at very low speeds for large volumes and faster for higher volumes. Horizontal stirrers at the bottom or top, by contrast must rely on high speed rotations that can damage the substance being stirred.

It is well documented in technical papers that spinning stirrers do not provide efficient mixing. The various patents cited are examples of methods to improve the conventional stirrers for better mixing, and all of these spinning type stirrers have disadvantages discussed in the following papers enclosed with the newly submitted IDS.

1. Visualization of Three Dimensional Chaos, J.M. Ottino, Science July 31, 1 998

2. Principles For Industrial Mixing, H. Venkitachalam

3. Choosing The Right Stirrer for RC1 Studies, 0. Ubrich, 02.03.02

4. Research Trends and Updates, Rutgers Chemical and Biochemical Engineering, Fluid Mechanics/Transport Phenomena, F. Muzzio, Fall 2002

As can best be appreciated by the short video on the CD enclosed with this Reply, the claimed stirrers operate at a low speed to create a better mixing of the liquid, without the disadvantages of the vortex stirrers.

For the above reasons provided above, it is respectfully submitted that the pending claims are in condition for allowance. Accordingly, reconsideration and allowance of the pending claims are respectfully requested.

If the Examiner does not believe that the claims are in condition for allowance, the undersigned invites the Examiner to contact him at 215-568-6400.

Respectfully submitted,

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